

EXHIBIT

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Report in the matter of
Ultima Services Corporation

v.

U.S. Department of Agriculture,
et al.

Case No. 2:20-cv-00041

Prepared By:

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A handwritten signature in black ink, appearing to read 'J. Guryan', with a stylized flourish at the end.

Date: April 4, 2022

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1. Introduction

I have been asked by counsel for Ultima Services Corporation (Ultima) to review the February 4, 2022 expert report of Defendants' expert, Jon Wainwright, Ph.D., (Dr. Wainwright) and the February 7, 2022 expert report of Defendants' expert Daniel Chow (Mr. Chow) and comment on their analyses. The remainder of this report outlines my opinions, my background and qualifications, the material I relied upon to form my opinions, and the details and explanation for my opinions.

2. Summary of Opinions

My opinions in this matter can be summarized as follows:

- Disparities and discrimination are not the same thing. Disparities are differences in an outcome between two or more groups. A disparity might be caused by discrimination, or it might be caused by other factors. The existence of disparities in a particular market does not mean the disparity was caused by discrimination in that same market. If a statistical analysis cannot rule out with a reasonable degree of certainty the possibility that factors other than discrimination in the market in question caused the disparities, then it cannot reject the hypothesis that the disparities are caused by things other than discrimination in the particular market.
- Dr. Wainwright presents a summary of 205 disparity studies that were completed between 2010 and 2021, but does not explain how he chose which studies to include in his analysis and which to exclude, nor does he describe how or whether he assessed the quality of the methods used in underlying studies he summarizes. If there is selection bias in the sample of studies that Dr. Wainwright relies upon, or if the underlying studies have flaws, then Dr. Wainwright's summary of the 205 studies is flawed.
- The majority of the analyses that Dr. Wainwright presents assess disparities in industries and markets that are different from the ones in which the Plaintiff operates. Discrimination in one market does not necessarily imply that there is discrimination in a different market. Discrimination in one

industry does not necessarily imply that there is discrimination in a different industry. In order to test whether discrimination exists in a particular market, a social scientist must analyze that particular market.

- The disparity indexes reported in the studies that Dr. Wainwright relies upon, as well as the majority of the calculations he does himself, are disparities, but do not offer information about the cause of those disparities. Unadjusted disparities may be caused by discrimination in that particular market, or may be caused by discrimination in a different market, or may be caused by non-discriminatory factors. Therefore, it is inappropriate to conclude from these disparities that the results are “consistent with discrimination” as Dr. Wainwright has not examined any possible explanation other than discrimination for the observed disparities.
- Many of the 205 studies Dr. Wainwright summarizes, including ones that he conducted himself, fail to control for differences in firm size or capacity when calculating disparity indexes. Larger businesses may bid for, and be able to take on, larger projects than smaller businesses. If there are more large non-minority owned than minority owned firms in an industry, there may be relatively more contract dollars awarded to non-minority owned firms in that industry even in the absence of discrimination in the selection of which businesses win contract awards.
- Mr. Chow’s analyses do not focus on the market in which Ultima operates. Similar to the analyses presented by Dr. Wainwright, it is not clear from Mr. Chow’s results whether the disparities he reports exist in the specific market in which Ultima provides services and would likely be bidding on contracts.
- Mr. Chow does not account for the bidding behavior of firms, or any details about the actual bids. One of the underlying assumptions in Mr. Chow’s analysis is that all of the firms in his database would be equally likely to be awarded contracts holding constant the factors he controls for. However, he does not, and cannot, control for whether a firm in his database actually bid on any federal contracts. Similarly, even for those firms that do bid on contracts, his database does not contain any information about those bids. Therefore, any differences in the types or details of bids that different firms submit is not accounted for in Mr. Chow’s analysis.

- Mr. Chow claims to be addressing the question of whether minority-owned firms are awarded federal contracts at rates comparable to other businesses. However, the database that Mr. Chow creates and analyzes only includes firms that have received federal contracts and only distinguishes whether that contract was an Indefinite Delivery Vehicle (IDV) or other award. Firms that did not receive contracts do not appear to be included in the data set Mr. Chow analyzed. If all firms in Mr. Chow's data set received awards of some type, it is not possible to conclude from an analysis of this data set anything about differences across groups in the likelihood of receiving or not receiving contract awards, much less attributing any estimated differences to discrimination.

3. Background and Qualifications

I am a labor economist. I graduated from Princeton University with a B.A. in Economics in 1996, and from the Massachusetts Institute of Technology ("MIT") with a Ph. D. in Economics in 2000. I am currently the Lawyer Taylor Professor of Education and Social Policy in the School of Education and Social Policy at Northwestern University. In addition, I am a Faculty Fellow at the Institute for Policy Research and a member by courtesy of the Economics Department and the Kellogg School of Management at Northwestern University.

From 2010 to 2019, I served as an editor of the Journal of Labor Economics (the leading field journal in labor economics), and I regularly serve as a reviewer for leading academic economic journals such as the American Economic Review, the Quarterly Journal of Economics, the Journal of Political Economy, the Review of Economics and Statistics and the Review of Economic Studies. In my role as editor, I assessed the scientific quality of academic studies, I chose peer reviewers for studies, and based on the advice of these peer reviewers and on my own assessment, I provided editorial guidance to authors and made decisions about whether submitted manuscripts were published.

Throughout my career, I have conducted research on a wide range of topics related to labor economics and the economics of education. As an example, I have

researched racial differences in wages and earnings, and the relationship between black-white pay differences and racial prejudice. Additionally, I have studied the effect of court-ordered school desegregation on the high school dropout rates of both black and white students. In my research, I often analyze large datasets using regression analysis and other statistical techniques. My economic research has been published in leading peer-reviewed journals such as the American Economic Review, the Journal of Political Economy, the Quarterly Journal of Economics, Developmental Psychology, the Journal of Educational Psychology, and the Review of Economics and Statistics.

I have presented my research findings on pending regulations to the U.S. Secretary of Education, Arne Duncan, and to a number of his top-level staff, as well as to the Office of Management and Budget, and to lead congressional staffers for committee chairmen in the U.S. Senate and the U.S. House of Representatives. My research was cited by the U.S. Secretary of Education in the release of a regulation issued by the U.S. Department of Education.

I have taught a Ph.D. level course called “Quantitative Methods” on statistical methods and regression analysis, and an undergraduate level course, called “The Economics of Inequality and Discrimination,” both at Northwestern University. In previous years, I have taught graduate-level courses on microeconomics and labor economics at the University of Chicago Booth School of Business. The courses on microeconomics relate to various forms of market competition, the economics of costs, determination of market prices, and consumer and firm behavior.

Since 2010 I have been affiliated with Charles River Associates (“CRA”). As part of this affiliation, I have provided expert reports and trial and deposition testimony in several matters, including both federal and state courts.

I am a Faculty Research Fellow at the National Bureau of Economic Research. In 2009, I was awarded the John T. Dunlop Outstanding Scholar Award, given every year for the best research on domestic labor economics by a scholar within 10 years

of completing a Ph.D. A copy of my current CV and testimony is attached to this report as Appendix A.¹

4. Summary of Defendants' Experts' Analyses

4.1. Dr. Wainwright's Report

In his February 4, 2022 Report, Dr. Wainwright presents three main analyses: (1) a summary of results from 205 disparity studies commissioned by state and local governments and public contracting entities since 2010; (2) calculations from the Census Bureau's *Annual Business Survey* (ABS) and *Survey of Business Owners* (SBO); and (3) regression analyses using the American Community Survey (ACS).

Dr. Wainwright summarizes results from 205 disparity studies commissioned by state and local governments and public contracting entities since 2010. Dr. Wainwright reports the percent of the disparity indices across all of these reports that were adverse to different protected groups. These disparity indices were calculated using various methods, in various locations, within various industries and across industries, and at different points in time.

Dr. Wainwright's second set of analyses calculates what he has called disparity indices using the SBO and ABS data. He calculates these as the difference between the racial distribution of firms in the US and the racial distribution in sales and receipts of those firms. Dr. Wainwright calculates his disparity index as the percent of total sales reported by firms owned by a given race group divided by the percent of total firms that are owned by that race group. He reports these calculations across all industries in the US, and also broken down by two-digit NAICS code (a code of up to six digits that identifies industries).

Finally, Dr. Wainwright presents results from regression analyses using ACS data from 2014 to 2018. Dr. Wainwright presents analyses of earnings, the likelihood of self-employment, and earnings from self-employment, and calculates differences in

¹ My billing rate is \$650 per hour and the staff working at my direction bill at rates ranging from \$280 to \$600 per hour. My compensation is not contingent on the outcome of this litigation.

these outcomes between various race groups and non-minority men. He presents some analyses without accounting for any factors others than race, and some analyses that account for various factors he categorizes as “qualifications” and “capacities.” These analyses are presented across all industries in the US, as well as for some 4-digit NAICS codes.

Based on his analyses, Dr. Wainwright concludes that “taken as a whole, they provide strong evidence of large, adverse, and statistically significant disparities facing minority-owned business enterprises in the United States. Moreover, these disparities cannot be adequately explained by differences between the relevant populations in factors untainted by the effects of discrimination and are therefore consistent with the presence of discrimination in the business market. This is the case in all major markets for government contracting and procurement including construction, AECRS, professional services, general services, and CSE, including those industries specific to the Plaintiff in this matter.”²

4.2. Mr. Chow’s Report

In his February 7, 2022 report, Mr. Chow presents regression analyses that examine differences in the likelihood of being awarded federal prime contracts among different groups. These analyses rely on data provided by the Small Business Administration from the System for Award Management (SAM) and from the Federal Procurement Data System (FPDS). The SAM data contain firm-level information for firms that have registered with the federal government.³ The FPDS data contain information about contract awards for small and non-small businesses.⁴ Mr. Chow states that “the data for registrants and awards were extracted for firms registered in SAM, or that had recorded transactions, from April 2019 to August 2020.”⁵ To create the database he uses for analysis, first Mr. Chow combines the SAM data and the FPDS data by a process of “merging and removal of redundant and extraneous observations.”⁶ He then removes three industries from his combined data set

² Wainwright Report, p. 81.

³ Chow Report, p. 3.

⁴ Ibid.

⁵ Ibid.

⁶ Chow Report, p. 3. It is unclear from his report what is meant by “redundant and extraneous observations.”

(Monetary Authorities-Central Bank, Private Households, and Public Administration). All of his subsequent analyses are based on this reduced data set.

Mr. Chow states that he modeled his analysis on a study conducted in 2012 by Robert N. Rubinovitz, Ph.D.⁷ Mr. Chow presents the results of logistic regression analyses that estimate the difference in the odds of being awarded a contract for different groups. He presents these results for all industries across the US, as well as separately by 3-digit NAICS code.

The following sections describe the methods that social scientists use to measure and test for discrimination, the limitations in some of the statistical analyses used to measure and test for discrimination, and the specific flaws in Defendants' Experts' analyses.

5. Disparities and Discrimination are not the Same Thing

Throughout their reports, Dr. Wainwright and Mr. Chow refer to disparities among different groups and calculations related to disparities. Disparities and discrimination are not the same thing. Disparities are differences in an outcome between two or more groups. A disparity might be caused by discrimination, or it might be caused by other factors. My understanding is that the various statistical analyses reported in the disparity studies relied upon by Dr. Wainwright and the analyses Dr. Wainwright and Mr. Chow conducted are intended to test whether discrimination caused disparities in the award of government contracts in the US, as well as whether discrimination caused disparities in earnings and business formation in the US. In fact, Dr. Wainwright's main conclusion from all of his analyses is that his results "are consistent with the presence of discrimination in the business market."⁸ Mr. Chow stated at deposition that his analyses are "consistent with discrimination."⁹

Analyses of the type Dr. Wainwright and Mr. Chow conducted measure differences in average outcomes by race and gender, in some cases controlling for a set of factors

⁷ Chow Report, p. 1.

⁸ Wainwright Report, p. 81.

⁹ Chow deposition, p.106, 110-111.

that the analyst chooses. If there is any variable or factor that is correlated with race or gender that also causes differences in the outcome of the analysis, the result can be a disparity by race or gender that is statistically significant even in the absence of discrimination. These analyses only measure the effect of discrimination if every other factor correlated with race or gender that determines the number of contracts awarded (or earnings or business formation) is controlled for in the analysis, or is ruled out as a cause of the disparity in some other way.

The existence of disparities in a particular market does not mean the disparity was caused by discrimination in that same market. Whether those disparities are caused by discrimination in that market is a different question. It is a causal question: Did discrimination in a given market cause the disparities in that market? Put differently: In the absence of discrimination by participants in that market, would the measured disparities exist? Those disparities could have been caused by non-discriminatory factors, by discrimination that exists outside of that market, by discrimination that exists in markets that affect participants prior to their participation in the market in question, by discrimination by participants in the market in question, or by other factors. If a statistical analysis does not consider these as possibilities, then it assumes the answer. If the statistical analysis cannot rule out with a reasonable degree of certainty the possibility that factors other than discrimination in the market in question caused the disparities, then it cannot reject the hypothesis that the disparities are caused by things other than discrimination in the particular market.¹⁰

6. Statistical Tests for the Existence of Discrimination

Social scientists recognize that the existence of a disparity in outcomes between two groups does not necessarily mean the disparity was the result of discrimination. This view is summarized, for example, in a 2004 report by the National Academy of Sciences entitled *Measuring Racial Discrimination*, which stated:

¹⁰ See e.g., Altonji and Blank, 1999, "Race and Gender in the Labor Market," in *Handbook of Labor Economics*, Vol. 3, Ashenfelter and Card, Eds. Elsevier Science; Blank, Dabady and Citro, 2004, *Measuring Racial Discrimination*, National Academies of Science, National Academies Press.

That racial disparities exist in a wide range of social and economic outcomes is not in question: They can be seen in higher rates of poverty, unemployment, and residential segregation and in lower levels of education and wealth accumulation for some racial groups compared with others. Large and persistent outcome differences, however, do not themselves provide direct evidence of the presence or magnitude of racial discrimination in any particular domain. Differential outcomes may indicate that discrimination is occurring, that the historical effects of racial exclusion and discrimination (cumulative disadvantage) continue to influence current outcomes, that other factors are at work, or that some combination of current and past discrimination and other factors is operating. (Blank et al, 2004, p. 5)

When faced with the question whether a particular type of discrimination caused a disparity, it is common practice within social science to consider whether the patterns observed in the data could have been generated in a world absent that type of discrimination. For example, if one were analyzing whether discrimination caused a difference in earnings between African-American and white workers, it would be necessary to consider whether the disparity was caused by a difference in years of completed education between the two groups of workers. Without considering this possibility seriously, the statistical analysis is neither complete nor valid. If the social scientist cannot, with a reasonable degree of certainty, reject the possibility that the patterns in the data (e.g., the disparity in outcomes between the two groups) could have been generated in the absence of the type of discrimination in question, then he cannot conclude that the particular type of discrimination caused the disparity. Therefore, it is necessary to assess whether factors other than discrimination in the market in question might account for the disparities in outcomes before a statistical analysis should draw an inference that discrimination in that market was the cause of the disparities. One method that is sometimes used to rule out other factors is a regression analysis.

Regressions are commonly used by social scientists to attempt to measure effects of discrimination in markets. For example, an economist might estimate a regression to test whether Black and white workers in a particular market are paid different amounts as a result of their race. This analysis builds on a definition of market

discrimination by Gary Becker, in *The Economics of Discrimination* (1957). In that book, Becker explains that discrimination exists in a labor market when two equally productive workers in different groups (e.g., racial groups) are paid different amounts. Equivalently, discrimination exists when workers are paid based on non-productive attributes, such as gender or race.

When regression is used to test for the presence of discrimination in markets, strong assumptions are necessary to attribute differences in outcomes between two groups to discrimination. Even when the estimated difference is statistically significant, an inference of discrimination is not necessarily appropriate. The standard use of regression to test for discrimination involves estimating a regression of some outcome (e.g., earnings) on an indicator for being in a group potentially subject to discrimination (e.g., African-Americans, or female), and some set of “control variables.” The regression estimates the average difference in earnings between non-African American and African-American individuals, holding the control variables constant.

There is consensus among social scientists who study discrimination in markets that a regression analysis of this type is a significantly flawed method of testing for the presence of discrimination, in part because most datasets do not include variables that measure enough of the potential factors it would be necessary to control for to reach such a conclusion.

For example, the National Academy of Sciences report, *Measuring Racial Discrimination*, stated:

The statistical decomposition of racial gaps in social outcomes using multivariate regression and related techniques is a valuable tool for understanding the sources of racial differences. However, such decompositions using data sets with limited numbers of explanatory variables, such as the Current Population Survey or the decennial census, do

not accurately measure the portion of these differences that is due to current discrimination. (Blank et al, 2004, p. 8)¹¹

The National Academy of Sciences report goes on to explain:

Omitted variables bias poses a serious problem for the large share of studies of racial differences in surveys (e.g., the Current Population Survey or decennial census long-form sample) having only a limited set of the characteristics that may reasonably factor into the processes under study. In such circumstances, it is possible to measure the extent of the difference in the outcome that is associated with race, but it is not possible to decompose that difference into a portion that reflects discrimination and a portion that reflects the association between race and omitted variables that also affect the outcome. Because researchers generally do not know whether or what critical variables have been omitted, they must be very careful in making the leap from statistical decompositions in a statistical accounting exercise as discussed above to conclusions of the role of discrimination. (Blank et al, 2004, pp. 138-139)

¹¹ Similar sentiments are expressed, for example, in Bertrand and Duflo (2017), "Field Experiments on Discrimination," in *Handbook of Economic Field Experiments*, Vol. 1, Banerjee and Duflo, Eds. ("The limitations of this approach are well known. The interpretation of the estimated "minority" coefficient is problematic due to omitted variables bias. Specifically, results of a regression analysis might suggest differential treatment by race or gender even if the decision maker (say, an employer) never used group membership in her decision of how much to pay an employee. However, it could be the case that race or gender is correlated with other proxies for productivity that are unobservable to the researcher but observed by the employer. It is therefore impossible to conclude that the employer used group membership in her decision-making process using this method." (p. 315)), and Lang and Spitzer (2020), "Race Discrimination: An Economic Perspective," *Journal of Economic Perspectives*, 34(2): pp. 68-89 ("Traditionally, much of the evidence for labor market discrimination came from ordinary least squares regressions with wages as the dependent variable and a set of control variables like age and education, along with a dummy variable for race, as the explanatory variables. The working assumption was that if the coefficient on the dummy variable for race was significant, this was evidence of discrimination. However, because the set of observable control variables for differences between blacks and whites was inevitably incomplete, at best the coefficient on race represented an unexplained differential that might reflect discrimination. In addition, some control variables might themselves reflect past discrimination. For example, using parental income as a control variable reduces the racial gap in earnings. However, lower levels of parental income for blacks relative to whites might reflect labor market discrimination experienced by their parents." (p. 70)).

6.1.1. Omitted variable bias

It is only possible to control for variables that are in the data set being analyzed. For example, suppose one were analyzing whether discrimination caused a difference in earnings between African-American and non-African-American workers. If there are ways that African-Americans and non-African-Americans participating in a market are different that are not controlled for in the regression, the estimated racial difference in earnings may suffer from what is called “omitted variables bias.” For example, suppose that African-Americans on average complete fewer years of education and that African-Americans have access to lower quality schools, and that data are available on how many years of education each individual completed, but not on the quality of schools each individual attended as a child. In this case, a regression could hold constant years of education, but not the quality of schools attended. Thus, in this hypothetical, the difference in earnings between African-Americans and non-African-Americans, holding everything possible constant, is not necessarily due to discrimination in the labor market. It may be due to differences in the quality of schools attended by African-Americans and non-African-Americans.

This idea applies more generally to any factor that affects the outcome of interest. The concept of “omitted variables bias” is important to the use of regression and other statistical tests for the purpose of measuring the effects of discrimination. Regression can measure differences in average outcomes between two groups, holding constant observable characteristics of members of those groups. However, to attribute that measured difference to discrimination, it is necessary to control for everything besides discrimination that might cause the average outcomes of the two groups to be different.

6.1.2. External validity

External validity refers to whether an estimate is informative of similar objects or concepts outside the population that the data being analyzed is supposed to represent (e.g., in other settings, for other groups of people, at other times). The concept of external validity applies to the use of statistical and regression analysis to test for disparities or the presence of discrimination. Finding a disparity in one market does not imply there is necessarily a similar disparity in another market. For

example, finding a disparity in one industry does not imply that there is necessarily a similar disparity in another industry. Finding a disparity in the private sector does not imply there is necessarily a similar disparity in the public sector. Finding a disparity in government contracting in one industry does not necessarily imply that there is a similar disparity in government contracting in a different industry.

6.1.3. Group-Specific Analyses of Discrimination

The statistical analysis of discrimination commonly involves comparing average outcomes in one or more groups that are potentially affected by discrimination to average outcomes in a reference group. When conducting such an analysis, it is important to analyze each group separately. Analyses that treat different groups as one, that combine groups, may give misleading results. If one group is negatively affected by discrimination and another is not, combining the two groups can make it appear that either both or neither group is negatively affected. An analysis that evaluates each group separately generates a separate estimate of disparity for each group analyzed, rather than a single estimate of disparity for all groups that are the potential subject of discrimination combined. Misclassification of observations, e.g., individuals or firms, into the reference group or into any of the potentially discriminated groups can also cause estimates of disparities and discrimination to be biased.

6.2. Other methods are regarded as superior ways to test for discrimination

While regression analyses can be a useful tool to test for disparities, the lack of data related to non-discriminatory factors that impact the outcome of interest often renders regression analyses limited in their ability to test whether discrimination caused an observed disparity. In an attempt to address these methodological flaws, social scientists have developed other methods that are regarded as superior ways to measure and test for discrimination. These other methods include audit studies, correspondence studies, field experiments, natural experiments, and marginal outcome tests.¹²

¹² Blank et al (2004) and Bertrand and Duflo (2017) discuss these methods.

7. Dr. Wainwright's Analyses Do not Investigate the Market Ultima Participates In and/or Suffer from Omitted Variable Bias

As discussed above, Dr. Wainwright presents three types of analyses to support his opinion that his results are "consistent with the presence of discrimination in the business market."¹³ Some of Dr. Wainwright's analyses are based on studies of markets that are different from the market covered by the 8(a) program, some are based on studies of markets that are different from the market in which Ultima operates, and some are not specifically related to federal contracting. Some of Dr. Wainwright's analyses fail to control for non-discriminatory factors that may explain the disparities he reports.

7.1. Dr. Wainwright's Summary of Prior Disparity Studies

In section II of his report, Dr. Wainwright presents a summary of 205 disparity studies that were completed between 2010 and 2021. From these studies, Dr. Wainwright "assembled all the availability and utilization statistics from these studies into a database, as well as the disparity indexes derived from them, in order to summarize and analyze the disparity findings across all of the studies."¹⁴ As Dr. Wainwright describes, the 205 disparity studies he relies upon come from various time periods, various locations (states, cities, counties) and various industries (measured with varying degrees of specificity). Each record in Dr. Wainwright's database represents one estimated disparity index from one of the studies.

To the extent there are flaws in the methods used in any of the underlying studies Dr. Wainwright summarizes, these flaws will carry forward into Dr. Wainwright's analysis. It is therefore important for Dr. Wainwright to make an assessment of each study's methods before including it in his analysis.¹⁵ Based on my own review, many of the studies Dr. Wainwright includes in his analysis contain flaws that make conclusions regarding the presence or absence of discrimination in relevant markets inappropriate.

¹³ Wainwright Report, p. 81.

¹⁴ Wainwright Report, p. 14.

¹⁵ See Wainwright deposition, p. 58, 65.

7.1.1. The 205 studies in Dr. Wainwright's analysis may be a selected sample

The 205 disparity studies in Dr. Wainwright's sample were commissioned by various state and local governments to investigate public-sector contracting in specific markets. These studies were published as support for the various Disadvantaged Business Enterprise (DBE) or similar programs in those locations and markets. In order to support a DBE program in a particular market, the state or local government must show evidence of the need for a DBE program in that particular market. Therefore, a disparity study that is published by a state or local government as support for a particular DBE program is likely to show disparities that the program is intended to remedy. If a study commissioned by a state or local government fails to show significant disparities in public contracting, the DBE program in that market would not have support based on that study. Potential DBE programs that do not exist because they would serve markets where there is not sufficient evidence of discrimination do not generate disparity studies for Dr. Wainwright to sample. It is unclear what the forum is for publication of a study that does not support a DBE program. If disparity studies are only published and publicly available when they provide support for a DBE program, then the studies Dr. Wainwright has access to will disproportionately show disparities that are adverse to minority groups. If the studies that Dr. Wainwright has access to are only the studies that show adverse disparities, then his sample may not be representative of disparities in other markets.

7.1.2. The majority of the disparity indexes in Dr. Wainwright's sample are not specific to the industry in which the Plaintiff operates

As described above, Dr. Wainwright summarizes the results of 205 disparity studies that contain disparity indexes from various locations, across and within various industries, and at various times. Even if it were true that the 205 studies were a representative sample, it is clear from Dr. Wainwright's report that the majority of the disparity indexes he relies upon assess disparities in industries and markets that are different from the ones in which the Plaintiff operates. As discussed above as it relates to external validity of results, discrimination in one market does not necessarily imply that there is discrimination in a different market. Discrimination in one industry does not necessarily imply that there is discrimination in a different

industry. In order to test whether discrimination exists in a particular market, a social scientist must analyze that particular market.

The contracts I understand to be at issue in this matter are contracts that Ultima Services competes for to provide administrative and/or technical support to the US Department of Agriculture.¹⁶ However, nearly all of the results that Dr. Wainwright presents in section II of his report are either unrelated to “administrative and/or technical support” or group together numerous other types of businesses and contracts with businesses that may not be similar to Ultima.

For example, Tables 2.2 through 2.7 of Dr. Wainwright’s report summarize disparities either across all industries in the US, or broken down into five general industry categories: Construction, AECRS, Professional Services, General Services, and CSE.¹⁷ The calculations that he presents across all industries show that disparities may exist in the US as a whole. A measured disparity in the US as a whole may be consistent with larger disparities in some industries and smaller, or even no, disparities in other industries. Dr. Wainwright also presents some analyses that group industries into categories. However, analyses that aggregate industries into groups of this size do not assess whether there is a disparity in any particular industry within the group. Of the broad industry categories Dr. Wainwright reports, Construction, AECRS, and CSE are not similar to the type of contracts that Ultima is bidding on, and both Professional Services and General Services include numerous types of contracts and firms that are outside of the relevant contracts at issue in this matter. Similar to Dr. Wainwright’s calculations across all industries, his calculations by broad industry group may not reflect the market conditions faced by Ultima or similar firms bidding on federal contracts.

The only analyses in section II of Dr. Wainwright’s report that attempt to examine the specific industries in which Ultima operates are reported in Table 2.8. In this table, Dr. Wainwright summarizes the results of disparity indexes calculated for several different NAICS (industry) codes: 541, 5416, 561, 5611, and 5613. Dr. Wainwright

¹⁶ Complaint in this matter, p. 2.

¹⁷ As noted in Dr. Wainwright’s report, AECRS stands for Architecture, engineering, and construction-related professional services, and CSE stands for Commodities, supplies, and equipment.

notes that all of the estimates he summarizes in Table 2.8 were from studies he conducted with NERA.¹⁸ However, even these more specific NAICS codes are over-inclusive and would include firms performing different services than Ultima. For example, NAICS code 5416 includes firms “primarily engaged in providing advice and assistance to businesses and other organizations on management, environmental, scientific, and technical issues.”¹⁹ Some of the top grossing firms in this industry code include Mercer (us) Inc., Booz Allen Hamilton Holding Corp, Accenture LLP, and Deloitte LLP, all of whom are consulting firms.²⁰ These are not the type of firms that Ultima competes with to provide administrative support and technical support services. Similarly, NAICS code 5613 includes employment agencies, executive search firms, and professional employer organizations. Although 5611 has fewer dissimilar companies, as explained below, the results there are unadjusted disparities that do not attempt to explain whether the disparity was caused by discrimination or some other factor.

7.1.3. The disparity indexes upon which Dr. Wainwright relies do not account for any non-discriminatory factors

As described in Dr. Wainwright’s report, calculating a disparity index relies upon the following process: (1) determine the relevant geographic market; (2) determine the relevant product market; (3) determine Minority-Owned Business Enterprise (MBE) “availability” in the relevant geographic and product market; (4) determine MBE “utilization” in the relevant geographic and product market; (5) calculate the disparity index as MBE utilization divided by MBE availability.²¹ The disparity indexes from each of the 205 disparity studies that Dr. Wainwright summarizes in section II are all calculated by dividing some measure of “utilization” by some measure of “availability” in various geographic and product markets.

Notably absent from this methodology is any control for non-discriminatory factors that may impact MBE utilization or availability. MBE utilization is typically calculated as the percent of contract dollars awarded to MBEs. MBE availability is often

¹⁸ See Wainwright Report, fn 41.

¹⁹ See <https://www.naics.com/naics-code-description/?code=5416>.

²⁰ Ibid.

²¹ Wainwright Report, p. 15-17.

calculated as the percent of firms in the given market that are MBEs, and in some cases that percentage is weighted by industry dollars or the “capacity” of the firms. The disparity indexes do not account for factors other than race or gender that may impact which firms receive contracts, including attributes of the firms, whether firms bid for contracts, or any information about the actual bids that firms proposed. As a result, the disparity indexes reported in the studies that Dr. Wainwright relies upon may measure disparities, but do not offer information about the cause of those disparities. Unadjusted disparities may be caused by discrimination in that particular market, or may be caused by discrimination in a different market, or may be caused by non-discriminatory factors. Therefore, it is inappropriate to conclude from these disparity indexes that the results are “consistent with discrimination” as Dr. Wainwright has not examined any possible explanation other than discrimination for the observed disparities. This analysis suffers from the type of omitted variables bias that the National Academy of Sciences warns about when trying to draw an inference about discrimination.

As an example, if in a particular market African-American owned firms are less likely to bid on federal contracts because those firms have more success in the private market, then it is likely that one would find “utilization” of African-American firms lower than their “availability” in the market. This result would not be due to some form of discrimination, but rather the difference in bidding behavior of African-American owned firms. Similarly, if historical and societal discrimination causes African-American owned businesses in a particular market to be smaller on average than other businesses, there may be a difference in capacity, and disparities between “utilization” and “availability” may exist in that market even in the absence of discrimination in federal contracting in that market. For example, if the effects of historical discrimination in a market are passed on through the intergenerational transfer of wealth, then one would expect African-American owned businesses in that market to be smaller on average than other businesses even in the absence of recent or current discrimination. Furthermore, none of the studies Dr. Wainwright relies upon control for the bidding behavior of firms in their calculation of disparity indices, and many of them do not control for the size or capacity of businesses. Without accounting for factors other than race/ethnicity, like these, many of the

studies Dr. Wainwright relies on cannot distinguish between a disparity and recent or current discrimination.

7.1.4. Many of the studies Dr. Wainwright relies on, including ones he conducted himself, fail to control for capacity when calculating disparity indexes

Many of the 205 studies Dr. Wainwright summarizes, including ones that he conducted himself, fail to control for differences in firm size or capacity when calculating disparity indexes.²² These studies compare the share of dollars awarded to minority versus non-minority firms (utilization) to the share of businesses that are minority versus non-minority firms (availability), without making an effort to account for differences in the size or capacity of minority versus non-minority owned businesses. Larger businesses may bid for, and be able to take on, larger projects than smaller businesses. If there are more large non-minority owned than minority owned firms in an industry, there may be relatively more contract dollars awarded to non-minority owned firms in that industry even in the absence of discrimination in the selection of which businesses win contract awards.

Consider for example an industry in which there are many smaller businesses and a few very large businesses. Consider the possibility that in this industry, the few very large businesses are non-minority owned. If businesses in this industry bid for contracts that are proportionate to their size, and contracts are awarded at equal rates to every business that bids for a contract, the ratio of utilization to availability (with no adjustment for capacity) will be lower for minority than non-minority businesses. The method that Dr. Wainwright uses to measure a disparity index would generate an index less than 1 in this case.

I expect that Dr. Wainwright would respond that capacity differences between minority and non-minority owned businesses is influenced by, i.e., “tainted” by, discrimination, and that therefore it is inappropriate to control for capacity in a statistical assessment of discrimination. Indeed, in footnote 26 of his report, Dr. Wainwright states that “‘capacity’ measures are all likely to be influenced by the

²² See Wainwright deposition, p. 67-68, 87, and e.g., Mason Tillman Disparity Study of City of St. Louis, April 2015, MGT of America, Inc. Alaska Department of Transportation and Public Facilities Disparity Study, August 18, 2014, BBC Research & Consulting 2019 Disparity Study, City of Indianapolis and Marion County.

presence of discrimination if it exists in the relevant markets. Consequently, building such metrics into the measure of availability will cause any resulting disparity statistic to be understated.” This response would miss the point.

First, that business size or capacity is affected, or tainted, by recent or current discrimination in a particular market or industry is an assertion that Dr. Wainwright has not tested. To the extent that there are differences in business size or capacity, these differences may be caused by historic or societal discrimination, by choices that business owners make, or by discrimination in the market in question. Dr. Wainwright’s choice not to control for firm size or capacity assumes that any differences in firm size or capacity is caused solely and fully by recent or current discrimination in the relevant market or markets. But, Dr. Wainwright has not conducted an analysis of whether, or to what extent, firm size in any industry has been affected by discrimination in relevant markets.

Second, if an analysis were to show that discrimination in a relevant market causes some, but not all, of a difference in the size of minority and non-minority owned businesses, failing to control for capacity differences would still be problematic. Consider the possibility that recent or current discrimination causes some portion of the difference in the size of minority and non-minority owned businesses, but that some of the size difference is caused by other factors such as historic or societal discrimination. Failure to account for the portion of the difference in size or capacity that is caused by those other factors would cause a disparity index to overstate the effects of recent or current discrimination in the relevant market. In the disparity studies Dr. Wainwright conducted, and in several of the other studies Dr. Wainwright summarizes, no adjustment is made for differences in capacity that are caused by factors other than recent or current discrimination.

7.2. Dr. Wainwright’s Analysis of SBO and ABS data

In Section III of his report, Dr. Wainwright presents several calculations of disparity indexes based on nationwide data from the 2012 SBO and 2017 ABS. In both cases, Dr. Wainwright calculates the disparity ratios as the ratio of what he calls utilization by firms owned by a given race/ethnic group divided by what he calls availability of

those firms. Dr. Wainwright calculates utilization as the percent of total sales/receipts dollars reported by firms owned by a given race/ethnic group, and calculates availability as the percent of total firms that are owned by that race/ethnic group. These calculations are presented across all industries in the US, and also broken down by two-digit NAICS code. Dr. Wainwright's calculations using the SBO and ABS data do not distinguish between sales/receipts dollars businesses receive through a contracting process from sales/receipts dollars businesses receive through any other means. Dr. Wainwright's analysis of the SBO and ABS data therefore cannot measure disparities that might exist specifically in federal contracting.

Similar to his analysis of the 205 disparity studies, as well as the underlying studies themselves, Dr. Wainwright's calculations of disparity indexes in Section III do not account for any factors other than race/ethnicity. As explained above, these unadjusted disparities fail to provide any information about the cause of the disparities, and therefore it is inappropriate to conclude from these disparities that the results are "consistent with discrimination." Unadjusted disparities may be caused by discrimination in that particular market, or may be caused by discrimination in a different market or historical discrimination, or may be caused by non-discriminatory factors.

Further, none of the results in Section III are specific to the industry or market in which Ultima operates. Similar to Dr. Wainwright's nationwide summary of disparity indexes in section II of his report, his calculation of disparity indexes across all industries in the US is not informative of whether disparities exist in any particular market or industry. Further, two-digit NAICS codes are quite broad definitions of industries and include firms that provide a variety of different services, and would not likely compete with Ultima for contracts. For example, NAICS code 56 is a broad definition of industry that includes firms such as travel agents, telemarketing firms, security and investigation firms, locksmiths, janitorial services firms, landscaping firms, and waste management firms.²³ The existence of disparities, or discrimination, in the market for the services of those other types of firms does not address whether

²³ See <https://www.naics.com/naics-code-description/?code=56#:~:text=56%20%2D%20Administrative%20and%20Support%20and%20Waste%20Management%20and%20Remediation%20Services>.

disparities, or discrimination, exists in the market for Ultima's services. Based on an analysis that combines firms and markets into a single NAICS code 56, it is unclear whether any disparities exist in the market for Ultima's services, or markets that impact the market for Ultima's services.

7.3. Dr. Wainwright's Analysis of ACS data

In section IV of his report, Dr. Wainwright presents the results of several regression analyses using ACS data. Specifically, Dr. Wainwright analyzes wages for all workers, the likelihood of individuals being self-employed (what he calls business formation), and the wages of self-employed workers. Dr. Wainwright first presents unadjusted analyses that do not control for any factors that may explain differences among race/ethnic groups, and then presents results after controlling for what he calls "qualifications" and "capacities." Similar to the prior sections of his report, Dr. Wainwright presents these results across all industries, as well as separately for certain NAICS codes (or groups of NAICS codes).

Note that none of the analyses that Dr. Wainwright presents using the ACS data specifically address potential disparities in federal contracting, nor can they distinguish between disparities that might exist in revenues businesses earn through contracting processes versus in revenues businesses earn in other ways. The ACS data contains information for a representative sample of workers across industries and occupations in the US. Dr. Wainwright's analyses – of earnings, of the likelihood of being self-employed, and of self-employment earnings – are not limited to individuals involved in federal contracting or seeking federal contracts, and do not distinguish between earnings generated through contracting versus through other processes. Therefore, the analyses in section IV of Dr. Wainwright's report cannot be used to support a conclusion that disparities, much less discrimination, exists in the market for federal contracting.

Furthermore, consistent with the other sections of his report, Dr. Wainwright's analyses using the ACS data are not specific to the industry in which Ultima operates. The closest Dr. Wainwright might come to analyzing Ultima's industry are the results he presents for NAICS code 561M. However, as noted in Dr. Wainwright's

report, the ACS data groups together NAICS codes 5611, 5612, and 5619 to create NAICS code 561M. NAICS code 5612 includes firms providing janitorial services, trash disposal, security services, and laundry services. NAICS code 5619 includes firms providing packaging and labeling services, and convention and trade show organizers. By combining all of the firms and markets into a single NAICS code 561M, it is unclear from Dr. Wainwright's analyses whether any disparities exist in the market for Ultima's services.

Further, much of Dr. Wainwright's analysis presented in section IV does not account for any factor other than race/ethnicity (what Dr. Wainwright calls "unadjusted disparities"). As explained above, these unadjusted disparities do not consider any explanation other than discrimination as the cause of the disparity. In other words, these regression analyses omit all variables that might explain race/ethnic group differences. Therefore, it is inappropriate to conclude from these disparities that the results are "consistent with discrimination" as Dr. Wainwright has not examined any possible explanation other than discrimination for the observed disparities.

In section IV.D, Dr. Wainwright does add some controls to his model that he refers to as "qualifications" and "capacities." However, even these analyses only account for a limited set of factors, and are the type of regressions from large survey data that the National Academy of Sciences specifically cautions about when stating that "it is possible to measure the extent of the difference in the outcome that is associated with race, but it is not possible to decompose that difference into a portion that reflects discrimination and a portion that reflects the association between race and omitted variables that also affect the outcome."²⁴

The "qualifications" that Dr. Wainwright accounts for are education, age, and geographic location.²⁵ This means that Dr. Wainwright has not accounted for any other factor that might impact someone's earnings or decision to be self-employed outside of their education, age, and geographic location. Any other factor that might impact earnings or the decision to be self-employed (e.g., college major, occupation,

²⁴ Blank et al, 2004, pp. 138-139.

²⁵ Note that from his report it is not clear how education or geographic location are specifically defined.

industry, quality of schooling, parents' socioeconomic background, the desire to be self-employed, etc.) is not accounted for in Dr. Wainwright's analysis. As a result, much of the variation in earnings, self-employment, and self-employment earnings is not explained by Dr. Wainwright's model, meaning that there are potentially many other factors related to these outcomes that Dr. Wainwright does not account for.²⁶ If any of these factors have differential outcomes by race/ethnicity, then Dr. Wainwright's estimates of disparities will be unreliable measures of discrimination.

The "capacities" that Dr. Wainwright includes are "indicators of individual financial assets, family structure, mobility, immigration status, military status (veteran), and local macroeconomic conditions by state." Even adding these controls does not substantially improve the explanatory power of Dr. Wainwright's model indicating that there still remains a large portion of the variation in earnings, self-employment, and self-employment earnings that are related to factors outside of Dr. Wainwright's model. Further, even if Dr. Wainwright's model controlling for "qualifications" and "capacities" accounted for all non-discriminatory explanations for disparities, none of the results he reports for self-employment earnings in NAICS code 561M are statistically significant. In other words, there are no statistically significant disparities between race/ethnic groups and non-minority males in 561M in what Dr. Wainwright refers to as "Business owner earnings."²⁷

8. Mr. Chow's Analyses Do Not Investigate the Market Ultima Participates In and Are Unclear in Their Conclusions

Mr. Chow presents the results of several logistic regressions (across all industries and separately by three-digit NAICS code) using data from the System of Award Management (SAM) and the Federal Procurement Data System (FPDS). He states that "the ultimate question of interest is whether the data show differences in the odds of contracts being won by minority-owned small businesses, especially those identified as SDBs and those participating in the 8(a) program, compared to other

²⁶ This can be seen in Dr. Wainwright's reporting of R-squared, which measures the amount of variation in the outcome variable that has been explained by the factors in the model. An R-squared value of 1 indicates that all of the variation has been explained by the model. All of the R-squared values in this section of Dr. Wainwright's report are below 0.5 (i.e., less than half of the variation in the outcome explained) and many are below 0.1 (less than 10% of the variation in the outcome explained).

²⁷ See Wainwright Report, Table 4.9.

small businesses.”²⁸ However, there are several issues with Mr. Chow’s analysis and interpretation of his results.

8.1. Mr. Chow’s analyses do not focus on the market for Ultima’s services

First, Mr. Chow presents some results from analyses that combine all industries in the US, and some that are calculated separately for each three-digit NAICS code. As explained in the sections regarding Dr. Wainwright’s analyses, analyses that combine all industries in the US potentially mask larger or smaller disparities in particular markets, or even disparities in outcomes for non-minority firms. These aggregate analyses do not offer any information related to the specific market in which Ultima bids on contracts.

In addition, Mr. Chow’s analyses broken down by three-digit NAICS code are also overly broad and don’t offer insight into the specific market in which Ultima bids on contracts. The majority of three-digit NAICS codes contain firms doing work that is very different from the services provided by Ultima. The three-digit NAICS codes that likely contains firms that are similar to Ultima are 541 and 561, but as explained previously, those codes also contain firms that are quite different from Ultima. NAICS code 561, for example, includes firms such as travel agents, telemarketing firms, security and investigation firms, locksmiths, janitorial services firms, landscaping firms, and waste management firms.²⁹ Similar to the analyses presented by Dr. Wainwright, it is not clear from Mr. Chow’s results whether the disparities he reports exist in the specific market in which Ultima provides services and would likely be bidding on contracts.

8.2. Mr. Chow does not account for any information about bidding behavior or the actual bids of firms

Second, the data on which Mr. Chow bases his analyses does not include any information about which firms actually bid on contracts or any information about the specific bids. The SAM database contains a list of firms that have registered with

²⁸ Chow Report, p. 7.

²⁹ See [https://www.naics.com/naics-code-](https://www.naics.com/naics-code-description/?code=561#:~:text=561%20%2D%20Administrative%20and%20Support%20Services&text=Industries%20in%20the%20Administrative%20and,day%20operations%20of%20other%20organizations)

[description/?code=561#:~:text=561%20%2D%20Administrative%20and%20Support%20Services&text=Industries%20in%20the%20Administrative%20and,day%20operations%20of%20other%20organizations](https://www.naics.com/naics-code-description/?code=561#:~:text=561%20%2D%20Administrative%20and%20Support%20Services&text=Industries%20in%20the%20Administrative%20and,day%20operations%20of%20other%20organizations).

SAM, but there is no distinction made between those firms that register and those that bid on federal contracts (either those that ever bid or regularly bid). Firms that are registered with SAM that never bid, or rarely bid, on federal contracts, would be less likely to be awarded contracts than firms that actively and regularly bid on federal contracts.

One of the underlying assumptions in Mr. Chow's analysis is that in the absence of discrimination all of the firms in his database would be equally likely to be awarded contracts holding constant the factors he controls for. However, he does not, and cannot, control for whether a firm in his database actually bid on any federal contracts. Similarly, even for those firms that do bid on contracts, his database does not contain any information about those bids. Therefore, any differences in the types or details of bids that different firms submit is not accounted for in Mr. Chow's analysis.

At deposition, Mr. Chow admitted that the potentially important omitted variable of the number of bids of each firm may explain the differences he observes.

Q: Okay. And if I understand the analysis correctly, one variable that was not used was failure to bid, right?

A (Mr. Chow): Correct, I have nothing in here about bidding.

Q: Okay. And so some of these odds might be attributable to the fact that different groups bid less often or more often?

A: Might be attributable, yes.

Q: Okay. There's nothing in your analysis that would eliminate that possibility; is that right?

A: Correct.³⁰

This exchange shows that Mr. Chow knows that his analysis does not account for at least one non-discriminatory reason (number of bids) for the disparities he observes. As explained above, without accounting for all possible factors outside of discrimination, it is not possible to conclude that the disparities were caused by discrimination.

³⁰ Chow deposition, p.98-99.

8.3. Mr. Chow's methodology does not support his conclusions

Third, based on the data and methodology Mr. Chow uses, his results do not support the conclusions that he reaches. Mr. Chow states in his report that "the ultimate question of interest is whether the data show differences in the odds of contracts being won by minority-owned small businesses, especially those identified as SDBs and those participating in the 8(a) program, compare to other small businesses."³¹ He also describes his combined analysis data set as a file consisting of "5,659,740 registration observations and 64 variables."³² I received a data file called "Awards_Combined_FY19FY20_SBNonSB.dta" that contains 5,659,740 observations and 64 variables.³³

In order to assess whether there are differences among groups in their odds of winning contracts, Mr. Chow must have data in his analysis file for firms that win contracts as well as for firms that do not win contracts. It is unclear from Mr. Chow's report or his deposition testimony what variable he is using in the database to indicate which firms won a contract and which firms did not. However, the data file that Mr. Chow produced appears to indicate that every record in the database is for a firm that won a contract, with some firms winning different types of contracts. There is a variable on the file called "AWARD_OR_IDV" that has a value of either "Award" or "IDV" for every one of the 5,659,740 records. If this variable indicates the type of award received (either a contract award ("Award") or an Indefinite Delivery Vehicle ("IDV"))³⁴ those values do not distinguish which firms were awarded contracts, but rather distinguish the type of award received among firms that were awarded contracts. As stated previously, every record in Mr. Chow's analysis data set indicates either an "Award" or an "IDV" which implies that every firm in his data set were awarded some type of contract. Firms that did not receive contracts do not

³¹ Chow report, p. 7.

³² Chow report, p. 3.

³³ From this database I have replicated the counts Mr. Chow presents in Table 1 of his report, though without further information on the details of his methodology I am unable to replicate the other analyses in his report.

³⁴ See https://www.fpds.gov/help_V1_0/Indefinite_Delivery_Contract.htm

appear to be included in the data set Mr. Chow analyzed.³⁵ If all firms in Mr. Chow's analysis data set received awards of some type, it is not possible to conclude from an analysis of this data set anything about differences across groups in the likelihood of receiving or not receiving contract awards, much less to attribute any estimated differences to discrimination.

8.4. Mr. Chow admits that he is not offering an opinion about discrimination in the market for federal contracts

Finally, though he did not express this opinion in his report, at deposition Mr. Chow stated that his results were "consistent with discrimination."³⁶ However, at deposition Mr. Chow also admitted that he is not offering an opinion that the disparities he observes were caused by discrimination in federal contracting.

Q: Do you have an expert opinion as to whether or not your study of lower ratios can be attributed to discrimination by the Federal Government?

A (Mr. Chow): No.³⁷

Given that Mr. Chow also opines that his results are "consistent with discrimination" it appears that he is trying to answer the question of whether any form of discrimination in any market exists, not whether discrimination in federal contracting for Ultima's services exists. If the relevant question in this case is whether discrimination caused disparities in the market for Ultima's services, then Mr. Chow's analysis and conclusions do not offer information helpful in answering that question.

9. Materials Relied Upon

In preparing this report I relied upon the following documents and data:

- Complaint in the matter of Ultima Services Corporation v. U.S. Department of Agriculture, et al., dated March 4, 2020;
- Report of Jon Wainwright, Ph.D., dated February 4, 2022;

³⁵ Note that there are firms in the SAM data set that I received that do not appear in Mr. Chow's analysis data set. It is unclear from the materials I received whether the firms in the SAM data set that do not appear in Mr. Chow's analysis data set are firms that did not receive awards or whether there is another reason that they are not included in Mr. Chow's analysis data set.

³⁶ Chow deposition, p.106, 110-111.

³⁷ Chow deposition, p. 98.

- Backup data and documents produced by Dr. Wainwright;
- Deposition transcript of Dr. Wainwright, dated March 7, 2022;
- Report of Daniel Chow, dated February 7, 2022;
- Backup data produced by Mr. Chow;
- Deposition transcript of Mr. Chow, dated March 10, 2022;

This report is based on the information available to me as of April 4, 2022. Should additional information become available, including but not limited to other reports from experts retained in this matter, it may be necessary to supplement or amend this report. At trial I may rely upon documents that have been produced or testimony that has been given in this matter. All opinions expressed here are made to within a reasonable degree of economic certainty.

APPENDIX A

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Northwestern University, Lawyer Taylor Professor of Education and Social Policy, School of Education and Social Policy, September 2019 – present.

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Northwestern University, Program Coordinator and Director of Graduate Studies, Human Development and Social Policy program, School of Education and Social Policy, September 2016 – 2019.

Northwestern University, Member by courtesy, Department of Economics and Kellogg School of Management, July 2010 – Present.

Education Lab, University of Chicago Urban Labs, Co-Director and Co-Founder, September 2011 – Present.

University of Chicago Booth School of Business, Associate Professor of Economics, July 2004 – 2010.

Princeton University, Industrial Relations / Education Research Sections Visiting Fellow, September 2006 – June 2007.

University of Chicago Booth School of Business, Assistant Professor of Economics, July 2000 – July 2004.

Education

Massachusetts Institute of Technology, 1996-2000, Ph. D. in Economics.

Princeton University, 1992-1996, A.B. in Economics, *Cum Laude*.

Journal Articles

- “Sibling Spillovers,” *Economic Journal*, January 2021, 131(633): 101-128. (joint with Sandra E. Black, Sanni Breining, David N. Figlio, Krzysztof Karbownik, Helena Skyt Nielsen, Jeffrey Roth and Marianne Simonsen).
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Grants

NICHD (1P01HD076816-01A1): “Remediating Academic and Non-Academic Skill Deficits among Disadvantaged Youth” (Guryan: Core Lead) 2014-2019. \$5,893,752

W.T. Grant Foundation (180140): “The Causes of Truancy and Dropout: A Mixed-Methods Experimental Study in the Chicago Public Schools” (Guryan:PI) 2011-2014.

NICHD (1R01HD067500-01): “A Randomized Study to Abate Truancy and Violence in Grades 3-9” (Guryan:PI) 2010-2015.

Institute for Education Sciences, U.S. Department of Education: “Preventing truancy in urban schools through provision of social services by truancy officers: A Goal 3 randomized efficacy trial (Chicago Public Schools)” (Guryan:PI) 2010-2014.

Smith Richardson Foundation: “Reducing Juvenile Delinquency by Building Non-Cognitive Skills: Experimental Evidence” (Guryan:PI) 2010-2012

University of Chicago Energy Initiative: “Health and Economic Costs of Climate Change” (Guryan:PI) 2008-2009.

W.T. Grant Foundation: “Proposal for multi-district randomized control trial of a voluntary summer reading intervention” (James Kim:PI, Guryan:Co-Investigator), 2007-2008.

National Science Foundation: “The Internet, Subsidies, and Public Schools,” (Austan Goolsbee:PI, Guryan:Co-Investigator), 2003-2007.

Working Papers

“Not Too Late: Improving Academic Outcomes Among Adolescents,” *NBER Working Paper 28531* March 2021 (joint with Jens Ludwig, Monica P. Bhatt, Philip J. Cook, Jonathan M.V. Davis, Kenneth Dodge, George Farkas, Roland G. Fryer Jr., Susan Mayer, Harold Pollack and Laurence Steinberg).

“Scope Challenges to Social Impact,” *NBER Working Paper 28406* February 2021 (joint with Monica P. Bhatt, Jens Ludwig, and Anuj Shah).

“The Effect of Mentoring on School Attendance and Academic Outcomes: A Randomized Evaluation of the Check & Connect Program,” *NBER Working Paper 27661* August 2020 (joint with Sandra Christenson, Ashley Cureton, Ijun Lai, Jens Ludwig, Catherine Schwarz, Emma Shirey and Mary Clair Turner).

“The Effects of Sexism on American Women: The Roles of Norms vs. Discrimination,” *NBER Working Paper 24904*, August 2018 (joint with Kerwin Charles and Jessica Pan).

“The Economics of Scale-Up,” *NBER Working Paper 23925*, October 2017 (joint with Jonathan M.V. Davis, Kelly Hallberg, and Jens Ludwig).

“Sibling Spillovers,” *NBER Working Paper 23062*, January 2017 (joint with Sandra E. Black, Sanni Breining, David N. Figlio, Krzysztof Karbownik, Helena Skyt Nielsen, Jeffrey Roth and Marianne Simonsen).

“The Effect of Mentoring on School Attendance and Academic Outcomes: A Randomized Evaluation of the Check & Connect Program,” *IPR Working Paper 16-18* November 2016 (joint with Sandra Christenson, Amy Claessens, Mimi Engel, Ijun Lai, Jens Ludwig, Ashley Cureton Turner and Mary Clair Turner).

- "Discrimination, Culture and Women's Outcomes in the U.S." working paper. July 2016 (joint with Kerwin Charles and Jessica Pan).
- "Not Too Late: Improving Academic Outcomes for Disadvantaged Youth," *IPR Working Paper 15-01* February 2015 (joint with Phillip J. Cook, Kenneth Dodge, George Farkas, Roland G. Fryer Jr., Jens Ludwig, Susan Mayer, Harold Pollack and Laurence Steinberg).
- "Summer Meltdown? Variation in Children's Noncognitive Skills Between School and Summer Months," unpublished manuscript, August 2016 (joint with Ijun Lai and Ariel Kalil).
- "Can a Scaffolded Summer Reading Intervention Reduce Socioeconomic Gaps in Children's Reading Comprehension Ability and Home Book Access? Results from a Randomized Experiment," *IPR Working Paper 15-15* October 2015 (joint with James S. Kim, Lauren Capotosto, David M. Quinn, Helen Chen Kingston, Lisa Foster, and North Cooc).
- "Thinking Fast and Slow? Some Field Experiments to Reduce Crime and Dropout in Chicago," *NBER Working Paper 21178*. May 2015. (Joint with Sarah B. Heller, Anuj K. Shah, Jens Ludwig, Sendhil Mullainathan and Harold A. Pollack).
- "Motivation and Incentives in Education: Evidence from a Summer Reading Experiment," *NBER Working Paper 20918*. January 2015 (Joint with James S. Kim and Kyung Park).
- "Does Reading During the Summer Build Reading Skills? Evidence from a Randomized Experiment in 463 Classrooms," *NBER Working Paper 20689*, November 2014 (Joint with James S. Kim and David M. Quinn).
- "Early Life Environment and Racial Inequality in Education and Earnings in the United States," *NBER Working Paper 20539*, October 2014 (joint with Kenneth Y. Chay and Bhash Mazumder).
- "The (Surprising) Efficacy of Academic and Behavioral Intervention with Disadvantaged Youth: Results from a Randomized Experiment in Chicago," *NBER Working Paper 19862*, January 2014, (joint with Philip J. Cook, Kenneth Dodge, George Farkas, Roland G. Fryer Jr., Jens Ludwig, Susan Mayer, Harold Pollack and Laurence Steinberg).
- "Do Lottery Payments Induce Savings Behavior: Evidence From the Lab," *NBER Working Paper 19130*, June 2013 (joint with Emel Filiz-Ozbay, Kyle Hyndman, Melissa Schettini Kearney, and Erkut Y. Ozbay).
- "The Effects of Poor Neonatal Health on Children's Cognitive Development," *NBER Working Paper 18846*, February 2013 (joint with David N. Figlio, Krzysztof Karbownik, and Jeffrey Roth).
- "Birth Cohort and the Black-White Achievement Gap: The Roles of Access and Health Soon After Birth," *NBER Working Paper 15078*, June 2009 (joint with Kenneth Y. Chay and Bhash Mazumder).
- "Prejudice and the Economics of Discrimination," *NBER Working Paper 13661*, December 2007 (joint with Kerwin Charles).

“Does Money Matter? Regression-Discontinuity Estimates from Education Finance Reform in Massachusetts,” *NBER Working Paper 8269*, May 2001.

Other Publications

“Studying Properties of the Population: Designing Studies that Mirror Real World Scenarios” (joint with Jonathan M.V. Davis, Kelly Hallberg, and Jens Ludwig). Forthcoming in *The Scale-Up Effect in Early Childhood and Public Policy: Why Interventions Lose Impact at Scale and What We Can Do About It*, Edited by John List, Lauren Supplee, and Dana Suskind. Routledge.

“Decreasing Delinquency, Criminal Behavior, and Recidivism by Intervening on Psychological Factors other than Cognitive Ability: A Review of the Intervention Literature,” in *Controlling Crime: Strategies and Tradeoffs*, Eds. Philip J. Cook, Jens Ludwig and Justin McCrary. University of Chicago Press, 2011. (joint with Patrick L. Hill, Brent W. Roberts, Jeffrey T. Grogger, and Karen Sixkiller).

“Making Savers Winners: An Overview of Prize-Linked Saving Products,” in Olivia S. Mitchell and Annamaria Lusardi, eds., *Financial Literacy: Implications for Retirement Security and the Financial Marketplace*. Oxford, UK: Oxford University Press, 2011, (joint with Melissa S. Kearney, Peter Tufano and Erik Hurst).

"taste-based discrimination", "The New Palgrave Dictionary of Economics", Eds. Steven N. Durlauf and Lawrence E. Blume, Palgrave Macmillan, 2009, The New Palgrave Dictionary of Economics Online, Palgrave Macmillan. 19 February 2010, DOI:10.1057/9780230226203.1906 (joint with Kerwin Charles).

“Trying to Understand the 2008-2009 Recession: Part 1, Perspective and Causes,” *Journal of Lutheran Ethics* 9, March 2009.

“Trying to Understand the 2008-2009 Recession: Part 2, Remedies,” *Journal of Lutheran Ethics* 9, March 2009.

“World Wide Wonder? Measuring the (non-)Impact of Internet Subsidies in Public Schools,” *Education Next*, Winter 2006 (joint with Austan Goolsbee).

“Should We Test Prospective Teachers?” *Perspectives on Work*, Winter 2005.

“How Financial Aid Affects Persistence: Comment,” in *College Choices: The Economics of Where to Go, When to Go, and How to Pay for It*, Caroline Hoxby, ed., 2004.

Awards and Honors

National Academy of Education, Elected member, 2021-present.

John T. Dunlop Outstanding Scholar Award, awarded by the Labor and Employment Relations Association, 2010.

Centel Foundation/Robert P. Reuss Scholar, Booth School of Business, University of Chicago, 2002-2003.

National Science Foundation, Graduate Research Fellow, 1996-1999.

Litigation Testimony and Expert Reports

Testimony at trial, hearing, and arbitration

“State of Colorado, ex rel. John W. Suthers, Attorney General, and Julie Mead, Administrator, Uniform Consumer Credit Code, v. Center for Excellence in Higher Education, Inc., et al.” District Court, Denver City and County, Colorado. Case no. 2014cv34530. Testimony at preliminary injunction hearing.

“State of Minnesota by its Attorney General, Lori Swanson v. Minnesota School of Business, Inc, et al.” State of Minnesota, District Court, County of Hennepin, Fourth Judicial District. Court file no. 27-CV-14-12558. Testimony at trial.

“Kenneth Martin, Aaron Truesdell, and Johnny Tejada, v. F.E. Moran Inc., Fire Protection of Northern Illinois.” U.S. District Court for the Northern District of Illinois, Eastern Division. Case No. 13 C 3526. Testimony at Daubert hearing.

“Kenneth Martin, Aaron Truesdell, and Johnny Tejada, v. F.E. Moran Inc., Fire Protection of Northern Illinois.” U.S. District Court for the Northern District of Illinois, Eastern Division. Case No. 13 C 3526. Testimony at trial.

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“Michael Allard v. General Mills, Inc.” American Arbitration Association. Case No. 01-17-0003-0905. Testimony at arbitration hearing.

“David Kirk v. General Mills, Inc.” American Arbitration Association. Case No. 01-17-0002-4460. Testimony at arbitration hearing.

“Michael Reynaud and Fiona Reynaud v. Ogletree, Deakins, Nash, Smoak & Stewart, P.C.; Technicolor Creative Services USA, Inc.” Superior Court of the State of California, County of Los Angeles, Central Branch. Case No. BC632972. Testimony at trial.

“State of Minnesota by its Attorney General, Lori Swanson v. Minnesota School of Business, Inc, et al.” State of Minnesota, District Court, County of Hennepin, Fourth Judicial District. Court file no. 27-CV-14-12558. Testimony at trial.

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“Whitney Ashby. v. Western Culinary Institute, LTD and Career Education Corporation.” American Arbitration Association. Testimony at arbitration hearing.

“Michael Pizzo v. Adtalem Global Education Inc. et al.” JAMS Ref. Number: 1340015940. Testimony at arbitration hearing.

“Archibald v. DeVry, et al.” JAMS Ref. Number: 1340016080. Testimony at arbitration hearing.

“Tillery v. DeVry Education Group, Inc., et al.” JAMS Ref. Number: 1340016095. Testimony at arbitration hearing.

“Caro v. DeVry Education Group, Inc., et al.” JAMS Ref. Number: 1340015757. Testimony at arbitration hearing.

“Osborne v. DeVry University, et al.” JAMS Ref. Number: 1340017973. Testimony at arbitration hearing.

“Jacobs v. DeVry University, et al.” JAMS Ref. Number: 1340017980. Testimony at arbitration hearing.

“Forsythe v. DeVry Education Group, Inc., et al.” JAMS Ref. Number: 1340016020. Testimony at arbitration hearing.

“Hrinda v. DeVry University, et al.” JAMS Ref No. 1340016074. Testimony at arbitration hearing.

“Perez v. DeVry University, et al.” JAMS Ref No. 1340018384. Testimony at arbitration hearing.

“Smith v. DeVry University, et al.” JAMS Ref No. 1340018381. Testimony at arbitration hearing.

“Haynes v. DeVry University, et al.” JAMS Ref No. 1340017974. Testimony at arbitration.

“Sandra Selden v. Des Moines Area Community College”, Iowa District Court for Polk County, Case No. LACL147358. Testimony at trial.

Deposition testimony

“Lerman v. Turner, Carter, Kapelke, Kelly and Columbia College Chicago.” U.S. District Court, Northern District of Illinois. 1:10-cv-02169. Deposition.

“Haley v. Cohen & Steers Capital Management.” U.S. District Court, Northern District of California. 4:10-cv-03856-PJH. Deposition.

“Midwest Fence Corporation v. U.S. Department of Transportation, et al.” U.S. District Court, Northern District of Illinois, Eastern Division. Case no. 10-cv-5627. Deposition.

“Jeffrey G. Gerasi v. Gilbane Building Company, Inc., AT&T, Services Inc., and Johnson Controls, Inc.” Circuit Court of Cook County, Illinois. Case no. 08 L 7258. Deposition.

“Midwest Fence Corporation v. U.S. Department of Transportation, et al.” U.S. District Court, Northern District of Illinois, Eastern Division. Case no. 10-cv-5627. Deposition.

“Beth A. Stokes v. John Deere Seeding Group, a subsidiary of Deere & Company a/k/a John Deere Company; and Jim Gunnison.” U.S. District Court for the Central District of Illinois Peoria Division. Case No. 4:12-cv-04054-SLD-JAG. Deposition.

“Thomas E. Perez, Secretary of Labor, United States Department of Labor v. American Future Systems, Inc. d/b/a Progressive Business Publications, a corporation; and Edward Satell, individually and as President of the above referenced corporation.” U.S. District Court for the Eastern District of Pennsylvania. Case no. 12-6171. Deposition.

“People of the State of Illinois, v. Alta Colleges, Inc., et al.” Circuit Court of Cook County, Illinois County Department, Chancery Division. Case no. 12 CH 01587. Deposition.

“Duane Porter, et al., v. Pipefitters Association Local Union 597, U.A.” U.S. District Court for the Northern District of Illinois Eastern Division. Case no. 12-cv-09844. Deposition.

“Randy C. Axelrod, v. Anthem, Inc. and All of its Affiliates, Wellpoint, Inc., and Amgen Inc.” Marion Superior Court, County of Marion, State of Indiana. Cause No. 49D03-0710-PL-042057. Deposition.

“Terry Christopher, v. Richard Smykal, Inc. and American Built Systems, Inc.” Circuit Court of the 12th Judicial Circuit, Will County, Illinois. No. 11 L 000526. Deposition.

“Jennifer DiPerna v. The Chicago School of Professional Psychology.” U.S. District Court for the Northern District of Illinois, Eastern Division. Case No. 1:14-cv-0057. Deposition.

“Timothy O’Brien, et al., v. Caterpillar Inc.” U.S. District Court for the Northern District of Illinois, Eastern Division. Case No. 14-cv-7229. Deposition.

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“Brenda Koehler, Kelly Parker, Layla Bolten, & Gregory Handloser v. Infosys Technologies Limited, Inc., and Infosys Public Services, Inc.” U.S. District Court for the Eastern District of Wisconsin. Civil Action No. 2:13-cv-885. Deposition.

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“Michael Reynaud and Fiona Reynaud v. Ogletree, Deakins, Nash Smoak & Stewart, P.C.; Technicolor Creative Services USA, Inc.” Superior Court of the State of California, County of Los Angeles, Central Branch. Case No. BC632972. Deposition.

“Jens Boy v. Zimmer, Inc.; Zimmer Dental, Inc. et al” Superior Court of the State of California, County of San Diego. Case No. 37-2016-00002761-CU-DF-CTL. Deposition.

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“Robert Bosch LLC and Bosch Brake Components LLC v. Nucap Industries Inc. and Nucap US Inc.” U.S. District Court for the Northern District of Illinois. Civil Action No. 15-cv-02207. Deposition.

“Brian Chan, et al. v. Big Geyser, Inc., Lewis Hershkowitz, Gerard A. Reda, Lynn Hershkowitz, Steven Hershkowitz, Eric Celt, Ron Genovese, Mike Wodiska, Kayte Mooney, and Dennis Tompkins.” U.S. District Court for the Southern District of New York. Case No. 17-cv-6473. Deposition.

“Tillery v. DeVry Education Group, Inc., et al.” JAMS Case No. 1340016095. Deposition.

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“Zdzislaw Stoch v. John Crane, Inc.” Circuit Court of Cook County Illinois. Case No. 2016-L-009400. Deposition.

“Lisa Carvalho v. Santander Bank, N.A.” U.S. District Court, District of Rhode Island. Case 1:19-cv-00287. Deposition.

“Nicholas Vichio v. US Foods, Inc.” U.S. District Court, Northern District of Illinois. Case No. 18-cv-8063. Deposition.

“Angel Omar Alvarez, et al. v. XPO Logistics Cartage LLC (Consolidated Action) and Victor Cortez Arrellano v. XPO Port Services Inc. (Consolidated Action).”, U.S. District Court, Central District of California, Case No. 2:18-cv-08220-RGK-E. Deposition.

“Aaron Senne, et al. v. Office of the Commissioner of Baseball, et al.” U.S. District Court for the Northern District of California. Case No. 3:14-cv-00608-JCS. Deposition.

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“Lerman v. Turner, Carter, Kapelke, Kelly and Columbia College Chicago.” U.S. District Court, Northern District of Illinois. 1:10-cv-02169. Expert report.

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“Report in the Matter of McMenimen & Associates, Inc. vs. In-Store Marketing Institute, Inc.” U.S. District Court, Eastern District of Wisconsin. 2:11-cv-01095-WEC. Expert report.

“Report in the Matter of Robert G. Blatz v. CubeSmart Trust, et al.” Court of Common Pleas for Chester County, Pennsylvania. 2011-08499. Expert report.

“Report in the Matter of Gary Van Poperin, et al. vs. Hewlett-Packard Company, Inc.” U.S. District Court, Eastern District of Michigan. 10-cv-11110. Expert Report.

“Report in the Matter of Midwest Fence Corporation v. U.S. Department of Transportation, et al.” U.S. District Court, Northern District of Illinois, Eastern Division. Case no. 10-cv-5627. Expert Report.

“Report in the Matter of Jeffrey G. Gerasi v. Gilbane Building Company, Inc., AT&T, Services Inc., and Johnson Controls, Inc.” Circuit Court of Cook County, Illinois. Case no. 08 L 7258. Expert Report.

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Education, Inc., et al.” District Court, Denver City and County, Colorado. Case no. 2014cv34530. Expert Report.

“Report in the matter of Joseph Dohl and Patricia Davis, v. Sunrise Mountainview Hospital, Inc., et al.” District Court, Clark County, Nevada. Case no. A698672. Expert Report.

“Expert Report of Dr. Jonathan Guryan” in “Duane Porter, et al., v. Pipefitters Association Local Union 597, U.A.” U.S. District Court for the Northern District of Illinois Eastern Division. Case no. 12-cv-09844. Expert Report.

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“Report in the matter of Kingston Parnell, et al. v. Centennial Hills Hospital Medical Center, et al.” District Court Clark County Nevada. Case No. A-14-710329-C.

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“Report in the matter of Cara Williams, et al., v. Wells Fargo Bank, N.A.” U.S. District Court for the Southern District of Iowa, Central Division. Case No. 4:15-cv-00038. Expert Report.

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“Declaration of Jonathan Guryan in Support of Defendant’s Opposition to Motion to Certify Class.” Nathan Surret et al. v. Western Culinary Institute, LTD and Career Education Corporation. Circuit Court for the State of Oregon for the County of Multnomah. Case No. 0803-03530.

“Report in the matter of Michael Allard v. General Mills, Inc.” American Arbitration Association. Case No. 01-17-0003-0905. Expert Report.

“Report in the matter of David Kirk v. General Mills, Inc.” American Arbitration Association. Case No. 01-17-0002-4460. Expert Report.

“Report in the matter of Denise Holtz v. General Mills, Inc.” American Arbitration Association. Expert Report.

“Report in the matter of Michael Murray v. General Mills, Inc.” American Arbitration Association. Case No. 01-17-0003-2050. Expert Report.

“Report in the matter of James Heflin v. General Mills, Inc.” American Arbitration Association. Case No. 01-17-0004-0321. Expert Report.

“Report in the matter of Peggy Maxe v. General Mills, Inc.” American Arbitration Association. Case No. 01-17-0005-2225. Expert Report.

“Report in the matter of PECO Pallet, Inc. v. Northwest Pallet Supply Co.” U.S. District Court for the Northern District of Illinois Eastern Division. Civil Action No. 1:15-cv-06811. Expert Report.

“Rebuttal Report in the matter of PECO Pallet, Inc. v. Northwest Pallet Supply Co.” U.S. District Court for the Northern District of Illinois, Eastern Division. Civil Action No. 1:15-cv-06811. Expert Report.

“Expert report in the matter of Robert Bosch LLC and Bosch Brake Components LLC v. Nucap Industries Inc. and Nucap US Inc.” U.S. District Court for the Northern District of Illinois. Civil Action No. 15-cv-02207. Expert Report.

“Expert rebuttal report in the matter of Robert Bosch LLC and Bosch Brake Components LLC v. Nucap Industries Inc. and Nucap US Inc.” U.S. District Court for the Northern District of Illinois. Civil Action No. 15-cv-02207. Expert Report.

“Report in the matter of Brian Chan, et al. v. Big Geyser, Inc., Lewis Hershkowitz, Gerard A. Reda, Lynn Hershkowitz, Steven Hershkowitz, Eric Celt, Ron Genovese, Mike Wodiska, Kayte Mooney, and Dennis Tompkins.” U.S. District Court for the Southern District of New York. Case No. 17-cv-6473. Expert Report.

“Report in the matter of Darryl Williams and Howard Brooks, et al. v. Jani-King of Philadelphia, Inc., Jani-King, Inc., and Jani-King International, Inc.” U.S. District Court for the Eastern District of Pennsylvania. Case No. 09-1738-RBS. Expert Report.

“Report in the matter of Jorge Valencia v. U.S. Bank National Association.” U.S. District Court for the Southern District of Iowa, Central Division. Case No. 4:18-cv-00056. Expert Report.

“Expert Affidavit of Dr. Jonathan Guryan.” Supreme Court of the State of New York, County of New York. Index No. 159947/2019. Affidavit filed in Tri-City, LLC, Endor Car and Driver, LLC, Lyft, Inc. v. New York City Taxi & Limousine Commission.

“Reply Affidavit of Dr. Jonathan Guryan.” Supreme Court of the State of New York, County of New York. Index No. 159947/2019. Affidavit filed in Tri-City, LLC, Endor Car and Driver, LLC, Lyft, Inc. v. New York City Taxi & Limousine Commission.

“Report in the matter of John W. Brennan v. Arthur D. Little, Inc.” Superior Court, Commonwealth of Massachusetts. CA No.: 1884-cv-02845. Expert Report.

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“Report in the matter of Omotola Owoeje, v. Adtalem Global Education Inc. et al.” JAMS Ref. Number 1340015799. Expert Report.

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“Report in the matter of Nicholas Vichio v. US Foods, Inc.” U.S. District Court, Northern District of Illinois. Case No. 18-cv-8063. Expert Report.

“Report in the matter of Mitchell Clements v. WP Operations LLC”, U.S. District Court, Western District of Wisconsin, Case No. 19-cv-1051-wmc. Expert Report.

“Report in the matter of Jared Mode, et al. v. S-L Distribution Company, LLC, S-L Distribution Company, INC., and S-L Routes, LLC.” U.S. District Court, Western District of North Carolina. Case No. 3:18-cv-00150. Expert Report.

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“Rebuttal Report in the matter of Angel Omar Alvarez, et al. v. XPO Logistics Cartage LLC (Consolidated Action)”, U.S. District Court, Central District of California, Case No. 2:18-cv-08220-RGK-E. Expert Report.

“Supplemental Report in the matter of Angel Omar Alvarez, et al. v. XPO Logistics Cartage LLC (Consolidated Action)”, U.S. District Court, Central District of California, Case No. 2:18-cv-08220-RGK-E. Expert Report.

“Supplemental Report in the matter of Victor Cortez Arrellano, et al. v. XPO Port Services Inc. (Consolidated Action)”, U.S. District Court, Central District of California, Case No. 2:18-cv-08220-RGK-E. Expert Report.

“Report in the matter of Mark Brackey, et al. v. Winnebago Industries, Inc., John Breuklander, and Gary McCarthy.” Iowa District Court for Winnebago County. Case No. LACV018026. Expert Report.

“Report in the matter of Klayton Fennell v. Comcast Cable Communications Management, LLC and Comcast Corporation.” U.S. District Court, Eastern District of Pennsylvania, Case No. 19-4750. Expert Report.

“Rebuttal Report in the matter of Carzanna Jones and Heynard L. Paz-Chow, on behalf of themselves and all others similarly situated, v. David Uejio, in his official capacity as Acting Director, and Consumer Financial Protection Bureau.” U.S. District Court, District of Columbia, Case No. 18-cv-2132-BAH (D.D.C.). Expert Report.

“Report in the matter of Jessica Smith, v. DeVry University, et al.” JAMS Ref. Number 1340018381. Expert Report.

“Report in the matter of Gwendolyn Haynes, v. DeVry University, et al.” JAMS Ref No. 1340017974.” Expert Report.

“Rebuttal Report in the matter of Aaron Senne, et al. v. Office of the Commissioner of Baseball, et al.” U.S. District Court for the Northern District of California. Case No. 3:14-cv-00608-JCS. Expert Report.

Other Reports

Oral presentations

Presentation of research findings to staff for Senator Tom Harkin.

Presentation of research findings to staff for Congressman George Miller.

Presentation of research findings to Congressional Black Caucus and Congressional Hispanic Caucus.

Presentation of research findings to senior staff, U.S. Department of Education.

Presentation of research findings to U.S. Secretary of Education, Arne Duncan.

Presentation of research findings to OIRA, Office of Management and Budget.

Written reports

“Report on Gainful Employment.” Prepared for the Career College Association.

“Comment on the proposed rule regarding Gainful Employment described in the NPRM released by the Department of Education on July 26, 2010.” Public comment submitted to U.S. Office of Management and Budget commenting on pending regulation.

Professional Activities

Editor, *Journal of Labor Economics*, December 2011 – 2020.

Member, AEA Committee on the Status of Women in the Economics Profession (CSWEP), November 2018 – 2021.

Research Associate, National Bureau of Economic Research. September 2010 – present.

Faculty research fellow, National Bureau of Economic Research, September 2000 – September 2010.

Northwestern University, School of Education and Social Policy, Executive Committee, September 2016 – present.

Northwestern University, Institute for Policy Research, Executive Committee, September 2012 – June 2019.

Board Member, Communities in Schools of Chicago, 2017 – present.

Co-Chair, J-PAL State and Local Innovation Initiative. 2015 – 2018.

Faculty Affiliate, Population Research Center, NORC, December 2000 – present.

Associate Editor, *Labour Economics*, 2010 – 2018.

Research Consultant, Federal Reserve Bank of Chicago.

University of Chicago Crime Lab, Faculty Affiliate.

Invited Participant, Young Faculty Leaders Forum, Harvard University.

Referee: *American Economic Review*, *Quarterly Journal of Economics*, *Journal of Political Economy*, *Review of Economic Studies*, *Journal of Public Economics*, *Journal of Labor Economics*, *Review of Economics and Statistics*, *American Economic Journal: Applied Economics*, *American Economic Journal: Economic Policy*, *Journal of Policy Analysis and Management*, *National Tax Journal*, *Economics of Education Review*, *European Economic Review*, *Journal of Human Resources*, *Regulation and Governance*, *Education Next*, *Education Finance and Policy*, *British Journal of Industrial Relations*, *Journal of Law and Economics*.

Teaching:

Northwestern University, School of Education and Social Policy: Quantitative Methods
The Economics of Inequality and Discrimination.

University of Chicago Booth School of Business: The Employment Relationship,
Microeconomics.